SCIENCE

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SCIENCE

NEW YORK, APRIL 8, 1892.

THE NEW METHOD OF PROTECTING BUILDINGS FROM LIGHTNING.

In April last I read a paper on my new method of lightning protection, before the American Institute of Electrical Engineers. This paper and the discussion were published in *Science* of May 8 and 15, 1891.

In that paper I stated that, simply as a matter of experience, I had failed to find a case on record of any damage by lightning, within certain limits given below, when the conductor was destroyed by the discharge. The why and the wherefore of this did not concern me, though of course interesting as theoretical questions.

As no exception was cited at the meeting referred to, and as I could not elicit the citing of an exception through the publication of the article in *Science*, or of the article or abstracts of it in the several electrical journals of the country, I began in the issue of *Science* for June 19, 1891, the regular insertion, which was continued till Feb. 15, 1892, of the following:—

Query.

Can any reader of *Science* cite a case of lightning stroke in which the dissipation of a small conductor (one-sixteenth of an inch in diameter, say,) has failed to protect between two horizontal planes passing through its upper and lower ends respectively? Plenty of cases have been found which show that when the conductor is dissipated the building is not injured to the extent explained (for many of these see volumes of Philosophical Transactions at the time when lightning was attracting the attention of the Royal Society), but not an exception is yet known, although this query has been published far and wide among electricians.

This has also failed to bring out a single exception to what, so far as I know, is true, that by the destruction of a small conductor all else is saved to the extent named.

Let me describe here in Franklin's own words a typical case of protection furnished by a small conductor dissipated by the discharge.

Franklin, in a letter to Collinson read before the Royal Society, Dec. 18, 1755, describing the partial destruction by lightning of a church-tower at Newbury, Mass., wrote: "Near the bell was fixed an iron hammer to strike the hours; and from the tail of the hammer a wire went down through a small gimlet-hole in the floor that the bell stood upon, and through a second floor in like manner; then horizontally under and near the plastered ceiling of that second floor till it came near a plastered wall; then down by the side of that wall to a clock, which stood about twenty feet below the bell. The wire was not bigger than a common knitting-needle. The spire was split all to pieces by the lightning, and the parts flung in all directions over the square in which the church stood, so that nothing remained above the bell. The lighting passed between the hammer and the clock in the above mentioned wire, without hurting either of the floors, or having any effect upon them (except making the gimlet-holes, through which the wire passed, a little bigger), and without hurting the plastered wall, or any part of the building, so far as the aforesaid wire and the pendulum-wire of the clock extended; which latter wire was about the thickness of a goose-quill. From the end of the pendulum, down quite to the ground, the building was exceedingly rent and damaged. . . . No part of the aforementioned long, small wire, between the clock and the hammer, could be found, except about two inches that hung to the tail of the hammer, and about as much that was fastened to the clock; the rest being exploded, and its particles dissipated in smoke and air, as gunpowder is by common fire, and had only left a black, smutty track on the plastering, three or four inches broad, darkest in the middle, and fainter towards the edges, all along the ceiling, under which it passed, and down the wall."

There can be plenty of cases cited of the failure of a large conductor to protect, as is well known to all who have looked into the subject. Of course, all sorts of excuses have been offered for the failure of the ordinary rods, which have been well put by Oliver J. Lodge, F.R.S., who has investigated the electrical problems connected with lightning and lightning protection more than any-one else, and is a complete sceptic as to the efficiency of rods, who says that "when, in spite of all precautions, accidents still occurred; when it was found that from the best-constructed conductors flashes were apt to spit off in a senseless manner to gun-barrels and bell-ropes, and wire-fences and water-butts, — it was the custom to more or less ridicule and condemn either the proprietor or its erector, or both, and to hint that if only something different had been done,— say, for instance, if glass insulators had not been used, or if the rod had not been stapled too tightly into the wall, or if the rope had not been made of stranded wires, or if copper had been used instead of iron, or if the finials had been more sharply pointed, or if the earth-plate had been more deeply buried, or if the rainfall had not been so small, or if the testing of the conductor for resistance had been more recent, or if the wall to which the rod was fixed had been kept wet,— then the damage would not have happened. Every one of these excuses has been appealed to as an explanation of a failure; but because the easiest thing to abuse has always been the buried earth connection, that has come in for the most frequent blame, and has been held responsible for every accident not otherwise explicable."

This fact of the complete protection furnished by a dissipable conductor stands, therefore, uncontroverted. One very pleasant endorsement comes from Moses G. Farmer, the veteran electrician, who writes: "My experience and observations both confirm his [my] views."

I repeat, Can any one cite a case of failure, not any theoretical considerations *pro* or *con*, but an actual case of failure under the conditions and to the extent named?

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TOX-ALBUMIN DIPHTHERIA.[1]

In a preliminary communication published in the Hospital Bulletin, No. 15,[2] we called attention to the histological changes in the organs of animals which had died of experimental diphtheria, following the inoculation of pure cultures of the bacillus diphtheriæ. Since then we have extended our investigations so as to include the study of the lesions produced by the inoculations of the toxic products of the diphtheria bacillus. This study virtually finishes the work we have undertaken, and it is hoped soon to publish our results in detail. However, in order to make our preliminary communication complete, we append this report: —

The toxic products of the diphtheria bacillus with which we have operated were obtained by filtering through a new and sterilized Chamberland filter the culture of the organisms in glycerine bouillon, several weeks old. The fluid so obtained was tested by means of cover-slips and inoculations on glycerine-agar, and proved to be sterile.

Guinea pigs were used for the experimental inoculations. The sterile culture fluid was introduced subcutaneously into the tissues of the belly wall by means of a Koch's syringe. The method pursued will be given in connection with the case of which the lesions are to be described. The guinea pig received on Dec. 10, 1891, one cubic centimetre of the filtrate. Not having succumbed on Dec. 14, it received two cubic centimetres more. The animal died on Jan. 5, 1892, the duration of life since the first inoculation having been three weeks and five days, and since the last three weeks and one day.

At the autopsy the vessels of the subcutaneous tissues were injected, and hemorrhage had taken place into the tissues of the axillary and inguinal regions. The subcutaneous tissues were moist, but there was no actual œdema present. Neither was there a visible area of localized inflammation; no microscopical examination was made of the seat of inoculation. The lymphatic glands of the axillary and inguinal regions were enlarged and reddened, the cervical glands were swollen, and the thyroid gland was greatly congested.

There was a considerable excess of clear fluid in the peritoneal cavity. Both layers of the peritoneum were reddened, the vessels of the visceral layer being especially injected. The spleen was enlarged to double the average size. It was mottled, and the white follicles were distinctly outlined against the red ground. The liver was dark in color, and contained much blood. On the surface a prominent yellowish-white area two millimetres in diameter, surrounded by a zone of hyperæmia, was observed. Smaller dot-like points of the same color and general appearance were seen elsewhere in the liver. The kidneys were congested and the cut surface was cloudy. The adrenal glands appeared normal, as did the mesenteric glands.

The pleural cavity did not contain such a marked excess of fluid. The pericardial sac, however, was distended with clear serum. Under the epicardium were many ecchymotic spots. The lungs exhibited areas of intense congestion, or actual hemorrhage into the tissues. The glands of the thorax were, perhaps, swollen.

The examination of the heart muscle by means of frozen sections showed it to be slightly fatty. The epithelium of the tubules of the kidney was extremely granular and much swollen, but not fatty. The liver was very fatty; the lighter areas and dots were seen to correspond to foci of dead liver cells, whose refractions were much greater than that of the normal cells.

Cultures were made from the blood and organs of the animal, and they remained sterile. Cover-slips also were examined and no organisms found.

The histological lesions observed in this case are identical with those described by us in connection with the inoculations of the living organisms. Lymphatic apparatus: In general, the changes are the same throughout. They are found in the greatest intensity in the glands of the axillary and inguinal regions, and less in the bronchial and cervical, mediastinal, and mesenteric glands. Yet these are considerably affected. The same fragmentation of nuclei affecting the lymph-nodes and sinuses is met with. These fragments exhibit the variety of form previously described by us, and they have the same affinity for coloring agents. Much of the nuclear detritus is free, but a part is contained within large pale cells. In the spleen there is a similar diffuse fragmentation of the nuclei of the spleen cells. Both the lymphoid cells of the follicles and the larger cells of the sinuses are affected. Like the lymphatic glands, some of the nuclear detritus is enclosed in large cells. Besides the destruction of cells in the spleen there is hemorrhage into the organ, or an extreme degree of congestion, so that the tissue elements are widely separated from one another. Nuclear figures occur in the lymph glands and spleen. In the former they are found among the fragmented cells.

Stained sections of the liver, especially those stained in methylene-blue and eosine, show the yellowish-white areas to be composed of hyaline, necrotic liver cells. The necrotic cells stain deeply in the eosine, and they are usually devoid of nuclei. They form, on the whole, more or less definite foci of hyaline cells into which leucocytes have wandered. The largest area was two millimetres in diameter, and the outlines of it were formed by hemorrhage into the tissues corresponding with the hyperæmic zone spoken of above. The cells in this focus have lost their nuclei and they are intensely refractive. Many of the dead cells have retained their individuality, and, indeed, their borders are more distinct than those of the normal cells. Others, however, tend to become fused together and to lose their individual cell outlines. Occasionally, outside the main focus of hyaline cells, single necrotic cells occur, which are surrounded by quite normal ones. Many leucocytes have wandered into this area of dead liver cells, and they are especially abundant at one place in the focus in which the hyaline cells are in process of disintegration. An exquisite nuclear fragmentation is to be observed throughout this area.

Should the focus just described be compared to many similar foci which occur in the livers of animals dead of inoculation with the bacilli themselves, it will be seen to contain more polynuclear leucocytes within it. The explanation of this fact would seem to depend somewhat on the inoculation-time, but more, probably, on the progression, or stage, of the necrotic process. Inoculation of the bacilli usually leads to death in a very short time, twenty-four to forty-eight hours. In this inoculation with the toxic products alone, the incubation period exceeded three weeks. On account of this, time has been allowed for the softening and disintegration of the dead cells, and leucocytes have been strongly attracted to these foci.

In the kidneys, besides the condition described in the frozen sections, a slight fragmentation of the nuclei of the tubular

[1] "The Histological Lesions Produced by the Tox-Albumin of Diphtheria," by Wm. H. Welch, M.D., professor of pathology, and Simon Flexner, M.D., fellow in pathology. From the Pathological Laboratory of the Johns Hopkins University and Hospital. Bulletin of the Johns Hopkins Hospital, No. 20, March, 1892.

[2] Abstract, Science, No. 457, November 6, 1891.

epithelium is encountered. The lungs exhibit areas of hemorrhage into the alveoli, and in many of these there has been a desquamation of the alveolar epithelium. Sometimes the desquamated epithelial cells are quite normal in appearance, while at others they have fragmented nuclei. The collections of lymphoid cells around the medium-sized and larger bronchi show, however, more cells, the nuclei of which have suffered in this way.

The blood-vessels of the tissues generally contain fewer leucocytes in this instance than in those cases in which the bacilli were introduced beneath the skin. By the latter method an intense local inflammatory process is provoked, associated with the emigration of large numbers of polynuclear leucocytes. In the former, in which the filtrate, free from organisms, is used for inoculation, the local process is reduced to *nil*, there is no emigration of leucocytes, and the disease is general from its inception. This difference is sufficient to account for the occurrence of leucocytosis in the one and its absence in the other case.

It may be considered as established now that the toxic products and not the bacilli themselves invade the tissues in diphtheria. This fact would at once suggest that the general lesions (those produced at a distance from the seat of inoculation in animals, and the situation of the local process in human beings) were the effects of the soluble poison diffused through the body. Hence, it was desirable to demonstrate this assumption experimentally; and it is not unimportant to know that the lesions in the tissues produced by bacilli and the toxic principle on the one hand, and by the toxic principle alone on the other, are in perfect correspondence with each other. And, moreover, it would seem not to be superfluous to emphasize the occurrence of definite focal lesions in the tissues of the body, produced by a soluble poison circulating in the blood.

DESCRIPTION OF A SUPPOSED NEW SPECIES OF STOREERIA FROM FLORIDA, STOREERIA VICTA.

THE species of *Storeria* here to be described as new was found in the alimentary canal of a specimen of *Elaps fulvius*, which was taken on the banks of the Oklawaha River, Florida, by one of my students, Mr. H. T. Mann. The *Storeria* had been swallowed head first, and had been somewhat digested anteriorly, but the hinder half or two-thirds of the body had undergone little change. Sufficient traces of the cephalic plates were left to show that the latter were those of the genus *Storeria*, the loreal being certainly absent. About twenty-five of the anterior ventral plates were missing, but the number of these could be determined from the vertebræ there exposed.

The dorsal scales are in fifteen rows. When the scales of the middle of the back are compared under the microscope carefully with those of a specimen of *Storeria dekayi* of the same size, the former are plainly of a greater proportional width. Whether or not this will hold true in all cases I can not, of course, say. The ventral plates number 146, counting from the angle of the jaw. There are 60 pairs of subcaudal scales. The anal plate is divided. The total length of the specimen is 14 inches, of which 3 are tail.

The color is gray above, with a tinge of yellow. In the middle of the back are very faint indications of a clay-colored band. This occupies the median three rows of scales. The next row of scales on each side is occupied by an indistinct dusky line and by a row of black specks. These lie distant from one another about the length of two scales. Lower down on the sides the color becomes paler, but another dusky streak is seen lying partly on the lower row of scales and partly on the out ends of the ventral plates. The belly is pale yellow, with a row of small, but very distinct, black spots along each side. There is a single spot on each end of each ventral plate, lying about half-way from the middle line of the belly and the outer end of the plate. A few smaller, irregularly placed spots are also seen. The under surface of the tail is plain yellowish white. *Storeria dekayi* sometimes has black dots on the abdomen, but they are irregularly scattered, or at most do not form rows the whole length of the belly.

This species appears to differ from *Storeria dekayi* in the smaller number of dorsal scales (15 instead of 17), in the greater proportional width of the scales, in the somewhat greater number of ventral plates, and in the presence of the two rows of spots on the abdomen. As to the number of ventrals, Mr. Samuel Garman ("Serpents of N. A.," p. 31) states that they vary from 120 to 138. He mentions, however, a specimen from Jalapa, Mexico, which had 143 ventrals. It is possible that the animal which I here describe as new is a specimen of *S. dekayi* with a smaller number of scales than usual, but until there is other evidence of this, it seems better to regard it as different.

From *S. occipitomaculata* my specimen differs in having a considerably larger number of ventrals and subcaudals than have yet been attributed to that species, in the presence of the rows of ventral spots, and in size. The relations of the specimen appear to lie evidently with *S. dekayi*.

The oviducts of the specimen contained a dozen eggs, each somewhat more than a quarter of an inch in length. The coverings of the eggs are extremely thin, from which I infer that the animal brings forth its young alive. This is the case with *S. dekayi*, and probably with the other species of the genus.

The specimen here described will be deposited in the National Museum at Washington.

O. P. HAY.

Irvington, Ind., April 2.

THE HIGHER EDUCATION OF THE DEAF.

THE following letter was recently addressed to President E. M. Gallaudet of the National College at Washington, by Mr. A. L. E. Crouter, principal of the Pennsylvania Institution for the Deaf and Dumb:

PRESIDENT E. M. GALLAUDET, PH.D., LL.D.

My Dear Sir: Since my return from the meeting of the Board of the American Association to Promote the Teaching of Speech to the Deaf, held in your city in January, my thoughts have frequently recurred to a matter of much interest to the association, and, to my mind, of vital importance to your college work, namely, the introduction of oral methods in the instruction of a portion, at least, of the young men and women who come to you for a higher education than the primary schools of the country are able to afford them.

And, in venturing to address you formally upon the subject, I beg you to believe that I am not impelled by any spirit of captious criticism, nor by any desire to intermeddle with the affairs of your excellent and well conducted school, but simply and solely to suggest for your consideration a step which I sincerely believe will, if put into effect, greatly promote and extend the usefulness of the college whose affairs you have so long and so ably directed.

As you are aware, Mr. Greenberger, at our meeting in Washington, brought up the question of oral instruction (recitations) for oral students at Kendall Green, maintaining that, in a school supported by the national government, equal educational advan-

[1] From the Silent World.

tages and privileges should be accorded to the orally taught deaf and to the manually taught deaf, pursuing oral methods in the education of the former, manual methods with the latter. In bringing up the subject, Mr. Greenberger disclaimed any unfriendly feeling towards the college, and I wish to do him the justice to state that he had no desire to embarrass you in your noble work, but, moved by a sense of justice, he felt that the time had come when the association should take a stand in favor of the higher oral education of the orally taught deaf of the country, in the college at Kendall Green if possible, if impossible, then outside in a separate school. Now, while the question was disposed of, for the time being at least, in a way that exhibited the kindliest feeling toward you and your college work, I feel that sooner or later it will have to be met and disposed of to the advantage of the college or to its disadvantage, strengthening it if an oral department be added, weakening it if, refused in what they believe to be just demands, the friends of higher oral instruction for the deaf establish a separate college for their higher education. The oral instruction of the deaf, whether wisely or unwisely, is unquestionably commanding increased public attention and public sympathy, and the college that seeks to provide the highest and best educational facilities for the deaf as a class should stand ready to meet every reasonable demand. The number of orally taught deaf is constantly increasing, they are seeking higher instruction than the primary schools afford, where shall they obtain it?

They hesitate, and object, and refuse when directed to Kendall Green, not because it is not a good school, nor because its professors are not competent men, but because of a well-founded fear that that which they have spent much time and labor in gaining, namely, their speech and their ability to read speech, may be very seriously impaired. Shall this class of deaf-mutes come to Kendall Green to profit by instruction at the hands of its able and experienced professors, greatly strengthening the power and influence of the college, or shall they be driven to another school?

To me, interested as I am in the success of the only college for the deaf in the world, this is a most important question, and I believe it will receive the careful consideration that its importance demands at your hands. The formation of an oral department with the means you have at your command should not present any serious difficulties, nor prove seriously harrassing to your well-ordered college work. For material you would have the best from every school in the land, and for support you would have the sympathy and active influence of every friend of the deaf throughout the world.

A. L. E. CROUTER.

March 5.

NOTES AND NEWS.

THE faculty of Cornell University has been invited to send representatives to take part in the Tercentenary Festival of the University of Dublin, next summer, and has accepted, Professor Corson going as its representative. Dr. Thurston has received a personal invitation from the University of Dublin for the same occasion, and is expected, if he should be able to go, to remain in Dublin as the guest of Dr. Lucius O. Hutton of Fitzwilliam Place.

— The second number of 1892 of the Bulletin of the Ohio Experiment Station summarizes the experience of the station in the culture of mangolds and sugar beets. Mangolds have been grown on the station farm for ten or twelve years past, to serve as food for the dairy cows; twelve to fifteen tons per acre being an ordinary yield. The beets are eaten with great relish by the cows, they cause an increased flow of milk, and the milk is thought to be of a better quality. The milk from this dairy is sold direct to consumers, and these have claimed that they could tell when beet feeding began in the fall by the improved flavor of the milk. In 1891 a number of varieties of sugar beets were grown alongside the mangolds; it was found that the sugar beets were considerably less productive than the mangolds, yielding but seven to nine tons per acre, against twelve to twenty tons for the mangolds. The sugar beets, however, showed on analysis about six per cent of sugar, while the mangolds showed but three per cent. The labor-cost of producing an acre of beets is from thirty to forty dollars, as grown at the station, where they are planted in rows sufficiently wide to admit of horse culture. By planting in rows only half as far apart the crop might largely be increased, but the cost of cultivation would also be increased. In a bulletin issued a year ago by the Chemical Division of the United States Department of Agriculture, a table is given showing that the average cost of manufacture in 113 German beet sugar factories in 1889–90 was nearly $3 per ton of beets. If it were possible to raise an average crop of fifteen tons per acre of sugar beets in Ohio at a cost of $30 per acre, or $2 per ton, or to manufacture them at a cost of $3 per ton, the total cost for production and manufacture would be $75 per acre. Such a crop would yield 1,800 pounds of sugar, at the rate shown by the station analysis, worth $72 at four cents per pound, thus leaving no margin whatever to either producer or manufacturer to cover the losses from bad seasons on the farm or in the factory. It is true the present bounty would afford this margin; but the bounty ends with 1895, unless renewed, and its future is very uncertain. Sugar beets grown in the dry climate and on the rich soils of Nebraska and Iowa show an average of about thirteen per cent sugar, or more than twice that found at the Ohio station, thus following the well-known law that the sugar beet reaches its highest development in northern latitudes. Beets grown in northern Ohio would probably show a higher per cent of sugar than has been found at the station, but it is extremely doubtful if the culture and manufacture of sugar beets can be made profitable in any part of Ohio in competition with the more favored regions of the North-west and of California, and the Experiment station would advise Ohio farmers to be very cautious about entering upon any large undertaking in sugar beet culture. There are probably spots in northern Ohio where spring wheat could be grown, and it is possible cotton might mature in sheltered coves in Lawrence County; but it would hardly be advisable for the farmers of either section to enter into competition with the spring wheat growers of the North-west or the cotton planters of the Gulf States.

— The Oriental History Society of Altenburg will celebrate in the autumn of 1892 the seventy-fifth anniversary of its establishment, and will take advantage of this opportunity to pay tribute to three of the honorary members of the Society, by the erection of a simple, worthy monument in the capital city of Altenburg. They are Christian Ludwig Brehm, his son, Alfred Brehm, and Professor Schlegel, who died at Leyden. The researches of these three men in zoology, and particularly in ornithology, are known, not only among their associates, but throughout the world, and deserve that their memory should be honored. A committee, consisting of Prince Moritz of Saxe-Altenburg; Professor Dr. Blasius, Braunschweig; Dir. Professor Flemming, Altenburg; Major A. v. Homeyer, Greifswald; Hugo Koehler, privy-councillor of commerce, Altenburg; Dr. Keopert, Altenburg; Professor Dr. Liebe, privy-councillor, Gera; Professor Dr. Pilling, Altenburg; Dr. Reichenow, Berlin; Dr. Rothe, privy-councillor of medicine, Altenburg; Chevalier von Tschusi zu Schmidhoffen, Hallein; Dr. Voretzsch, Altenburg; and Dr. Leverkuhn, Munich, under the patronage of His Highness, Prince Moritz of Saxe-Altenburg, also an honorary member of the society, solicits contributions from the friends of these eminent scientists, for the purpose of aiding in the erection of the proposed memorial. It is respectfully requested that contributions be forwarded to Hugo Koehler, privy-councillor of commerce, in Altenburg, and that inquiries and letters be addressed to Dr. Koepert, in Altenburg.

— Mr. R. H Scott delivered a lecture at the Royal Institution on March 18, on a subject of much importance to England, viz.: "Atlantic Weather and its Connection with British Weather." He pointed out, says *Nature*, that less than a quarter of a century ago, before synchronous charts were in vogue, it would have been impossible to have traced a storm across America and the Atlantic to Britain's coasts; but this can now be done with considerable certainty. The broad principles which govern the weather system of the Atlantic were shown on two diagrams exhibiting the mean pressure, and the regions of greatest disturbance of temperature, on the globe in our winter. The latter chart showed that, at that

season, the relatively warmest district is near Iceland; and the barometer chart showed that close to the same region the barometer is lowest. The reasons of these relations, which involve the first principles of modern weather knowledge, were fully explained. The more northern part of the Atlantic area interests us the most. The whole region from 40° to 70° north is constantly visited by cyclonic depressions, and in order to throw some light on the origin and history of these depressions, and of the storms which they at times bring with them, various institutions have published daily maps of the weather in the Atlantic. The most complete of these maps were published by the Meteorological Office for thirteen months, commencing with August, 1882. The last twelve of these months have been carefully examined, and show no less than 264 depressions in various parts of the ocean. Of these, out of 62 which originated south of 40° north, only 16 had sufficient energy in them to cross the meridian of Greenwich, while out of 22 which originated further south only 11 crossed the Atlantic, and these were not all felt as actual storms in England. The practical outcome of obtaining telegrams from America has not been satisfactory, but this failure has probably been mainly due to the fact that the reports "have been neither numerous nor full enough." This accurately represents the case at the present time; but we hope it is not too much to expect that, with our present knowledge of the paths taken by depressions with regard to areas of high pressure, some further advance may shortly be made in predicting storms by means of more numerous and fuller telegraphic reports both from outward and homeward bound ships.

— At the British Institution of Electrical Engineers recently an interesting paper, illustrated by experiments, was read by Professor D. E. Hughes, F.R.S., on the value of oil as an insulator of electricity, especially for currents of high potential and frequency. Professor Hughes was led to recognize the merits and to suggest the use of oil as early as 1858, after the failure of the first Transatlantic cable, according to *Engineering*. It then appeared to him that a fluid insulator with self-correcting properties would be preferable to a solid insulator, such as gutta percha or india-rubber, which, when once punctured by a spark, cannot close the wound like oil, and thus renders the entire circuit useless until the fault is removed. Professor Hughes made many experiments on various oils at that time, and embodied his results in a British patent, dated Jan. 11, 1859, for "an improved mode of insulating electrical conducting wires." The oil he had found most serviceable was resin oil, which has an extraordinarily high resistance and is somewhat viscid. He proposed to contain it in tubes of gutta-percha or metal, through which the conductors, coated either with a thin layer of gutta-percha or merely covered with fibrous material, would run. The inventor tried for two years to get English electricians to adopt his method, but in vain; and, having to proceed to the Continent, he was obliged to abandon it. The late Mr. David Brooks of Philadelphia subsequently introduced it in America, with great success and profit to himself, for insulating underground telegraph wires. Oil is now used for insulating transformers, and it promises to be employed in a great many other ways.

— At the meeting of the Belgian Academy of Sciences on March 6, Professor Spring announced, as we learn from *Nature*, that the late Professor Stas had left, in an almost completed condition, a long and important memoir describing the results of several further stoichiometrical investigations. It is entitled "Silver," and will forthwith be edited, presumably by Dr. Spring, and published. It may be remembered that, after the publication of Professor Stas's classical memoir upon the preparation of absolutely pure silver and the atomic weight of that metal, doubts were thrown by Professor Dumas on the validity of the work on the ground that the silver employed was not free from occluded atmospheric gases. Moreover, Professor Dumas expressed doubts as to the bearing of the work upon the celebrated hypothesis of Prout, according to which the atomic weights of all the other elements are supposed to be multiples of that of hydrogen. For, if silver possessed the atomic weight attributed to it by Professor Stas, the atomic weight of oxygen became 15.96 and not the whole number 16, and consequently Prout's hypothesis in its original form would be negatived. In order to set these doubts at rest, and to leave his work in a perfected condition, Professor Stas prepared a quantity of silver with such extreme precautions that he succeeded in obtaining it entirely free from occluded gases, and from even the minutest traces of the materials of the vessels employed. So perfect is the purity of this silver that even when heated to the temperature of the melting-point of iridium not a trace of sodium can be detected in the spectrum of the vapor. With this silver he repeated his former determinations of the atomic weight of the metal, and it is satisfactory to learn that the final number obtained is, as Professor Stas himself expected it would be, identical with that formerly obtained. Hence the objection of Professor Dumas cannot longer be entertained, and the atomic weight of oxygen would indeed appear to be 15.96 and not 16, for the numbers obtained by Professor Stas agree so remarkably that an error of four-hundredths of a unit would apparently be out of the question. In addition to this important memoir, Professor Stas has also left the data of a series of twelve separate determinations of the stoichiometric relation of silver to potassium chloride, the materials for which were the pure silver just described, and a specimen of potassium chloride, also prepared with a care and precaution quite in keeping with the rest of the work of the great analysist. The results of these determinations are described by Professor Spring as agreeing in a most wonderful manner, and will afford another valuable base to which the atomic weights of many other elements may be referred. Besides these two memoirs, a third is mentioned by Professor Spring, relating to the spectra of several metals which Professor Stas obtained in the purest state in which these metals have ever probably been seen. The whole of these memoirs, consisting of about fifteen hundred pages of manuscript, it is intended to publish forthwith in three separate treatises.

— Although preparations of lettuce have from very early times had a reputation in medicine for their soporific properties, the narcotic constituent of the plant has never been ascertained with any certainty. Various neutral, fatty, and waxy bodies separated from the milky sap of different species of Lactuca have been from time to time described as compounds of medicinal value, but on the other hand it has been denied that the dried milk-sap, lactucarium, in spite of its narcotic odor, possesses any sedative action, and in fact this preparation is no longer officinal in England or the United States. It is therefore interesting to learn in a communication from the Research Laboratory of the Pharmaceutical Society, read recently before the Clinical Society, that Mr. T. S. Dymond has established beyond doubt the presence of hyoscyamine, the principal alkaloid of belladonna and henbane, not only in the cabbage and Cos varieties of the common lettuce, L. sativa, but also in the wild lettuce, L. virosa. The amount in the young plants is certainly very minute, but in the officinal green extract, which, according to the directions of the "British Pharmacopœia," is to be prepared from the flowering herb of L. virosa, the mydriatic alkaloid occurs to the extent of 0.02 per cent.

— In a communication to the Paris Academie des Science, M. Le Chatelier states that by means of his pyrometer he has discovered that the temperatures which occur in melting steel and in other industrial operations have been overestimated. These exaggerations, we learn from *Engineering*, the author attributes to several causes. When estimates of temperature disagree there is a natural tendency to adopt the highest, because there is an instinctive desire to establish some sort of proportionality between the light emitted from a heated body, the amount of fuel required, and the temperature. But the fact is that both the amount of light emitted from a body, and the quantity of fuel required to heat it, increase much more rapidly than the temperature. Moreover, the calorimetric method has been that most frequently adopted for determining high temperatures. In this the assumption is made that the specific heat of the iron rods or balls used is constant, which is inaccurate. In the case of the flame of the Bessemer converter Mr. Langley has fixed the temperature of the issuing flame at 2,000° C., because platinum appears to melt rapidly in it. Mr. Chatelier has, however, found that platinum does not fuse in the flame, but only appears to do so because it alloys itself with drops of molten steel carried over by the blast.

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CURRENT NOTES ON ANTHROPOLOGY.—III.

[*Edited by D. G. Brinton, M.D., LL.D.*]

An International Anthropometric Scheme.

Dr. R. Collignon of the French Army is well known as one of the most active students of anthropology in France. His researches on the tribes of North Africa are classical. He has just issued a "Projet d'Entente Internationale pour arrêter un Programme commun de Recherches Anthropologiques," which should attract the earnest attention and co-operation of followers of this science the world over.

Without entering into the other details of his plan, those relating to the actual measurements desired may be here stated. In all cases there should be noted the height, the color of the eyes, as either light, dark, or intermediary; color of the hair, as either red, blond, intermediate, brown, or black; line of the nose, as either convex, straight, or concave. In addition to these, on forty subjects, the two factors of the nasal index should be carefully noted; finally, on twenty of these the following head measurements: maximum antero-posterior diameter, maximum transverse diameter, maximum bizygomatic diameter, total height of head.

Of course, the value of such statistics for comparison will depend a good deal on the operative methods employed. Dr. Collignon explains these with great care; and I would urge all who would like to aid in this admirable project for international scientific work to address him for particulars, as follows, Dr. Collignon, 42 Rue de la Paix, Cherbourg (manche), France.

Embryonic Causes of Variations in Vertebrates.

The fundamental question in anthropology is that of the causes which have led to the differences in the races of men. Hitherto most writers have been content with surface generalizations about "environment" and "heredity." The disciples of Spencer have rung the changes on these with little positive profit. We have no knowledge what heredity really is, and "environment" has borne more than its share of causality.

A real step in advance has been taken by Dr. Dareste, in his work on "Teratogeny," or the artificial production of monsters. He shows conclusively that monsters or monstrosities are not the result of pathological changes in the embryo, as has hitherto been supposed, but are modifications of the processes of organic evolution, precisely analogous to those which bring about the differences which distinguish individuals and races in mankind. This can be proved experimentally in oviparous animals, the domestic fowl, for instance. By developing the chick in an artificial incubator and subjecting the egg to unusual conditions, such as shaking it from time to time, varnishing it, exposing it to rapid changes of temperature, etc., we can produce monstrosities in all points analogous to those in man.

The changes take place in the earliest epochs of embryonic life and are in two directions: 1, arrest of development; 2, union of homologous parts. The former assures the permanence of an embryonic condition, the latter produces the phenomenon of double monsters. By tracing the conditions which yield these exaggerations, we may distinctly perceive the causes of many of the physical peculiarities of man.

Application of Psychological Research to Anthropology.

Experimental psychology is a comparatively new realm of research, and we may confidently expect from it most valuable aid in defining the differences between the races of men. Its main object may be said to be the measurement of the relative rapidity, intensity, and persistence of mental actions. This means that it endeavors to discover material gauges and mathematical formulas for the sensory, motor, and intellectual processes. Think what this involves! Nothing less than that we shall be able to measure the mental abilities of a man as we do his height and girth!

Though this goal is probably theoretical, as the individual generally eludes averages, these are true for the mass, and we may be sure that a series of observations on, say twenty, pure adult types of the several races would yield results markedly different and highly significant. The points to be examined are such as these: the rate of muscular movement, rapidity of nervous impulse, transmission of motor and sensory stimuli, race-differences in reaction-times, sensation-areas, differences in estimating weights, judgment of the passage of time, sensibility to pain, the rate of forgetting, etc. With the excellent psychological laboratories now in operation at several of our leading universities, these comparative observations could readily be made, and they certainly promise most important results.

Curious Testimony to the Value of the Nasal Index.

In 1882 the British Government began an ethnographic and anthropometric inquiry into the native races of India. The results, which are now nearly ready for publication, will fill four bulky volumes, and will contain a mass of most valuable material for the study of these interesting peoples. A glimpse of some of them is presented in an article in the last volume of the *Journal of the Anthropological Institute*, by Mr. H. H. Risley of the Bengal Civil Service. One of the most noteworthy is the conclusion that there are really no physical differences between the Kols and the Dravidian tribes, in spite of the radical diversity of their languages. Neither of them discloses any Mongoloid affinities, though a number of tribes in northern and eastern Bengal are clearly akin to that great Asian race.

But the most curious statistics are those relating to the nasal indices of the tribes examined. They corroborate the high value of this physical element in racial anatomy. The nasal index is found in India in two widely distinct types; the one platyrhine to a degree closely approaching the negro (88–95), the other leptorhine about in the same proportion as in western Europe (67–72). These indices bear a constant relation to the order of social precedence, to the distinctions of caste, and to the organization of the family. "It may be laid down as a working hypothesis, if not as an absolute law, that the social position of a caste varies inversely as its nasal index." Everywhere the narrow-nosed Brahmin is at the top, the broad-nosed Pariah at the bottom. Wherever there is a high index,—above 80,—we find a low social position and the totemic sub-division of the tribe; wherever the index is low,—below 75,—we are equally sure to meet high rank and an eponymous family system.

Incidentally it may be added that these investigations bear out the ancient Indian traditions that the Aryan nations of India entered the peninsula from the north-west, and destroyed or subjugated the ancestors of the dark, flat-nosed Kols, the "snub-nosed blacks," often referred to in the ancient Vedic war-songs.

OSTEOLOGICAL NOTES.

IN previous papers (*Science*, Vol. xvi., p.382, Vol. xvii., p. 117, Vol. xviii., p. 53) we have assumed that the modifications presented by the jugal arch in the Mammalia are due to the various influences derived from use or disuse, correlated necessarily with the habits and environment of the animal. In no order is the specalization of the arch, under the influences of natural selection, more clearly exhibited than in the Insectivora.

Adopting the classification of the highest authorities, and notably that of Dr. Dobson, this order may be divided into two sub-orders, first, Dermoptera, embracing only one species —Galeopithecus volaus—and, second, Insectivora Vera, which comprehends all the remaining families. This second sub-order may be divided in turn into two groups. In the first,—including the families Tupaidæ, Macroscelidæ, Erinaceidæ, Talpidæ, and Soricidæ,—the true molars have W-shaped crowns. In the second group, including the Centetidæ, Solenodontidæ, Potamogalidæ, and Chrysochloridæ, these same teeth have V-shaped crowns.

Accepting the above classification, the Insectivora, so far as concerns the jugal arch, may be brought into three groups.

1. Those in which the arch is complete and well developed, comprising the Tupaidæ, Macroscelidæ, Rhynchocyonidæ, Galeopithecidæ.

2. Those in which the arch is complete but more or less feebly developed, comprising the Erinaceidæ, Talpidæ, Chrysochloridæ.

3. Those in which the arch is partially or wholly deficient, comprising the Centetidæ, Potamogalidæ, Solenodontidæ, Soricidæ.

The Tupaia (Squirrel-shrew) may be taken as a typical form of the first group. The jugal arch is well developed, a post-orbital process from the frontal meeting a corresponding one from the malar, thus forming a complete bony orbital ring. The malar has a large longitudinal oval vacuity, which, although unique in this case, when taken with similar vacuities in the palate of this genus, as also in some of the other Insectivora, points unmistakably to the Marsupilia. The horizontal curvature of the arch is sufficient to counteract any inherent weakness due to the vertical curvature with its convexity downwards. The temporal fossa is moderately extended, while the coronoid surface of the mandible presents a large backward projecting surface rising high above the transversely produced condyle.

In the second group, where the arch although complete is for the most part weak, the cranium presents marked modifications. In Erinaceus and Gymnura the arch is formed mostly by the processes of the Squamosal and maxilla which join, while the molar is very small and occupies in a splint-like form the outer and under sides of the centre of the arch. There are no traces of any post-orbital processes. The temporal fossa is deep and extended, while additional surface is afforded for the temporal muscle by the prominence of the sagittal and occipital crests. The ascending ramus of the mandible with its broad concave coronoid surface and the development of the pterygoid fossæ denote increased masticatory powers, in spite of the apparent weakness of the buttress.

In the Talpidæ, certainly in all of the truly fossorial of the family, the jugal arch is slender and exhibits no distinct malar bone, no occipital or sagittal crests, and no post-orbital processes. The mandible is long and the vertical portion presenting a moderately extended coronoid surface with a small transverse condyle. The infra-orbital foramen is of great size, being a very slender osseous arch which serves for the transmission of the large infra-orbital branch of the trifacial, which affords the necessary supply of sensory nerves to the muzzle.

In the Chrysochloridæ (Golden moles), which in the general shape of the skull present modifications different from all other Insectivora, the jugal arch is in some species so expanded vertically, that, as Dr. Dobson remarks, "their upper margins rise above the level of the cranium giving additional origin to the large temporal muscles." There is no post-orbital process given off either by the frontal or zygomatic arch. As regards the mandible, the coronoid process is little elevated and in some species is nearly level with the transversely extended condyle.

In the third group the arch is incomplete, and in one instance, at least, may be described as entirely absent. In the Centetidæ, the skull is long and narrow, and marked by largely developed occipital and sagittal crests which serve as attachments for the muscles of temporal origin. The zygomatic processes of the maxilla and squamosal are very short and rudimentary, while the malar is entirely absent. The temporal fossæ are very large, and the skull retains nearly the same width at their anterior and posterior regions. There is not a trace of a post-orbital process. The infra-orbital foramen is circular, and capacious. There are no pterygoid fossæ. The coronoid process of the mandible is largely dedeloped, its inner surface being concave, and its outer surface flattened. The condyle is small and circular, while the glenoid surface is transversely concave.

The other families of this group with the exception of the Soricidæ agree with the Centetidæ in the modifications of the skull that have been described. In the Soricidæ the cranium is broadest just behind the glenoid surfaces. There is no jugal arch and no trace of a post-orbital process. Frequently there is present a strongly marked lambdoidal ridge as well as a sagittal crest. There is no pterygoid fossa, but very large vacuities exist on each side of the basis cranii.

The mandible resembles that of the Talpidæ, although the horizontal ramus is shorter, while the ascending one "pre-

sents a very large and singularly deep excavation upon its internal surface quite characteristic of the genus." The articular surface of the condyle looks backwards instead of upwards. The angle of the jaw is elongated and thin.

The infra-orbital is large and bounded posteriorly by an osseous bar.

It will thus be seen that, in those families of higher forms which compose the first group, the jugal arch presents a typical formation.

In the second group, the slight modifications indicative of weakness, to whatever cause they may be assigned, are amply recompensed by the presence of cranial crests for increased muscular insertion.

More or less disuse, as the result of the loss of masticatory power, which is not needed, has so modified the arch in the last group that it has become much reduced, and in some cases has entirely disappeared. D. D. Slade.

Cambridge, April, 1892.

ATTEMPTED EXTERMINATION OF THE POCKET GOPHER, GEOMYS BURSARIUS.

The ravages of the pocket gopher extended very generally throughout the State of Iowa, but came under my own personal notice in the rich and fertile farm lands of Poweshiek County and surroundings. The annual loss they occasioned became a matter of such serious moment to the farmers of this county that on Jan. 8, 1890, an unusually liberal measure was voted by the board of supervisors, to the effect that "a bounty of ten cents a head be paid on gopher scalps taken in Poweshiek County, subject to the same laws and conditions that pertain to the payment of bounties on wolf scalps, and pockets must be produced in each case before the claimant will be entitled to the bounty."

These concealed little pests not only feed on surrounding vegetation, but, what is worse on the whole, choke it out by the innumerable mounds of earth heaped up by them everywhere.

I have seen fields which were literally black with gopher hills, and, if rooting swine can be said to upturn a field, so can the gopher. Besides, the loss by accidents to machinery and animals occasioned by striking against the gopher hills, or by sinking into their runs or holes, is very considerable. So while it is not to be marvelled at that some concerted action should be taken towards the extermination of such a pest, yet the high price paid for the experiment must excite some comment.

Taking into account the liberal bounty offered, the universal prevalence of gophers in countless numbers, and the fact that their capture was attended with but little labor, and only trifling cost, it can readily be seen how trapping by men, as well as boys, was at once tremendously stimulated.

It actually became a lucrative employment, at which the trappers spent their time in whole or in part for practically the entire year. The trapping began as early as February, and continued as late in the fall as December; the result of it all being that the incredible number of 140,000 was trapped and paid for in Poweshiek County during eleven months of the year ending December, 1890. The gopher pockets were taken instead of their scalps, and the price paid for 140,000 pockets by one county amounted to $14,000. As skill comes with experience, and as the great gopher populace of the county was but slightly thinned out, it was my judgment and that of others, that the catch of 1891 would considerably exceed that of 1890; some estimating the number that would be trapped as high as 200,000.

Accordingly the probable price which the county would have to lavish on gopher bounties bade fair to reach proportions that might bankrupt an ordinary county. While these facts were forcibly borne in on all taxpayers, yet the farmers were willingly taxed, even adding to the bounty in many cases to encourage trapping on their own lands, and stoutly defended the measure in opposition to the citizens of towns and villages who very unwillingly submitted to a taxation that seemed to them to discriminate between town and country rodents, believing that it was quite as fair and reasonable to apply the tax to the extermination of town rats as to field gophers.

An attempt to change the law failed, owing to the farmers' support, but in the winter of 1891 a resolution was passed reducing the bounty to five cents and requiring the claimants to present the fore legs instead of the pockets.

As a direct result of the reduced bounty, rather than a result of diminished gophers, the catch for the year ending December, 1891, was but 18,000, and of these no doubt a part was trapped in 1890. Trapping began in April and ended in December.

The gopher is a prolific rodent, and it seems almost absurd to believe that in a county where they probably number millions that their ranks have been noticeably thinned or their ravages diminished. The most sanguine supporters of the gopher bounty allowed not less than five years for their hoped-for extermination.

Taking into account their present numbers, their prolific natures, and underground habits, the attempt to oust them once for all seems almost a ridiculous undertaking. But what renders the present errand particularly bootless is the gopher at large in surrounding counties where no bounty is offered for their capture. The most persistent concerted action on the part of all the counties, while it might check the pestiferous gopher, could scarcely expect to destroy it; much less can an isolated county like Poweshiek, in the very heart of a gopher paradise, expect to reach that unattainable end.

Among the interesting nuts to crack offered the bounty supporters are a few considerations like the following.

As the gophers are thinned out in Poweshiek to the point where trapping is less profitable than in adjoining counties, the elastic consciences which some trappers are said to have will suffer them to trap outside and sell to the more liberal county, in spite of the binding oath which they must take.

But another absurd temptation was placed in the way of the faltering trapper. He could, in Iowa County, present to the county auditor the fore-legs of the gopher he had trapped, and draw his bounty where fore-legs were equivalents of scalps, and by crossing the line he could present the pockets of the self-same abused gopher and draw from the Poweshiek treasury an additional bounty on their pockets, thus making the poor gopher do him double duty. It is a known fact that all have not been slow in rising to their opportunities and drawing double bounty on the unfortunate victims of the trap.

In trapping gophers, it is the common practice to dig down and bury ordinary steel traps in their runs, and to visit these at stated intervals. The traps are not bated.

Among the gophers caught albinos are met with occasionally. During the fall of 1890 there were brought to me several gophers with white pelage — a dirty white — looking like a winter coat.

If albinos, their eyes were not pink, which suggested the possibility of an overlooked variety. From Mr. F. W. Porter,

the auditor of Poweshiek County, who has furnished me many facts and figures, I learn that trappers speak of a white variety, counted by them particularly wary and hard to catch.

One caught in Grinnell was marked with hinder parts white and fore parts brown.

To those who have not seen the pocket gopher, it may be well to state that they are a small rodent of about the same color as, and perhaps a shade larger than, the domestic rat.

They have no external ears, have small bead-like eyes, a short tail, and powerful fore-legs, armed with strong claws for digging; and, what is very characteristic, they have large extensible cheek pouches or pockets. The presence of the gopher is made known to you by its mounds of earth, about the size of large ant-hills, rather than by its own presence, for it is rarely indeed that they are seen.

ERWIN H. BARBOUR.

University of Nebraska.

WIND-STORMS AND TREES.

Two very severe wind-storms have recently swept over Iowa which injured trees of all kinds, but especially some of the conifers. I have no record of the velocity of the wind in the storm of several weeks ago. It was less severe, however, than the one of last Friday. According to the weather office observations as reported in the *Iowa State Register* of April 2, the maximum speed was sixty-four miles an hour at 2 P.M. in Des Moines, Iowa. The gale started at daybreak, "By 11 the wind had reached an average velocity of fifty miles an hour, and it was approaching the danger-point. It kept gradually increasing until 2 P.M., when the wind-gauge at the top of the Federal building swung around to an average velocity of sixty-four, with sudden flaws above the 100-point." The weather observer, Mr. Schaffer, states that at the period of its greatest velocity the amount of pressure thrown against houses, glass, etc., was fifty pounds per square foot. The wind on Friday came from the south-west, and later shifted to the west. The severe wind-storm of several weeks ago came from the north. As usual in storms of this kind old and poorer branches fell readily, and trees suffered severely in consequence of the injury because of the many open wounds. I shall give a few illustrations how different trees were affected. On the college grounds, there are cultivated a large number of European as well as native trees. A few old trees were blown down, but these were partly decayed in the interior. Both gales seem to have been hard on some of the conifers. In some cases the ground was strewn with green leaves and short branches. In point of greatest injury Norway spruce (*Picea excelsa*) stands first. The branches broken off varied from one to six years' growth, mostly two and three years. It is also noticeable that many of the branches did not break at the beginning of the year's growth but in the middle. In many cases the branches are stripped of their leaves in the direction of the wind, — south, west, and north sides of the tree. The Scotch pine (*Pinus sylvestris*) is also affected, but in this case branches only, as a rule, were severed from the plant. The branches vary from one to six years' growth, occasionally more, but mostly within this limit. The same tendency to snap off in the middle of the year's growth may be observed. Few leaves were blown off.

Black spruce (*Picea nigra*) stands next. Some branches and leaves were broken off, though not nearly as many as in the other species.

White spruce (*Picea alba*) was also affected, but it seems able to stand the severity of the wind much better than the Norway spruce and Scotch pine. It is followed closely by the Hemlock (*Abies Canadensis*),—injury mostly confined to the leaves. There is only a single tree on the ground, which grows in a somewhat less exposed place than the white and Norway spruce, so that it may not be a fair test.

Red, or Norway pine (*Pinus resinosa*), some branches blown off and but few leaves. White pine (*Pinus strobus*), few leaves, a number of branches.

Balsam Fir (*Abies balsamea*) has suffered less than any of the above, a few branches were blown off.

Austrian pine (*Pinus Austriaca*) and Dwarf Mountain pine (*P. pumilio*) have lost few leaves and branches The red cedar (*Juniperus Virginiana*) should be classed with it. An occasional branch of *Larix europæa* and *L. laricium* may be found.

On the whole, the deciduous trees have fared better than the evergreens. Some species of willows (*Salix*) have lost many branches. The cottonwood (*Populus monilifera*) and soft maple (*Acer saccharinum*) have lost some branches. Honey locust (*Gleditschia triacunthes*, hackberry (*Celtis occidentalis*), hard maple (*Acer barbatum*), green ash (*Fraxinus viridis*), *Crataegus punctata* have not suffered.

L. H. PAMMEL.

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RUSSIAN SUNFLOWER INDUSTRY.

THE sunflower, as a garden plant, has been known all over Russia for many years, but only in certain districts has it been cultivated on a large scale as an industry. The first cultivation of sunflower seed for commercial purposes began, says the United States Consul General, at St. Petersburg, in 1842, in the village of Alexeievka, in the district of Berutchinsk, government of Voronezh, by a farmer who was the first to obtain oil from the seed. This farmer soon found many followers, and the village of Alexeievka soon became the centre of the new industry. The government of Voronezh is even now the chief district in European Russia for the growing of the sunflower. Besides the district of Berutchinsk, this plant is cultivated on a large scale in the districts of Novokhopersk, Ostrogoshk, Bobroosk, Valouisk and Korotoiaks. From the government of Voronezh the cultivation of sunflowers spread to the adjacent governments of Tamboo and Saratov, where there are large fields cultivated with this plant, particularly in the latter government. The people of the province of the Don and the governments of Simbersk and Samara are more or less engaged in this trade, in fact in the entire south east of Russia the sunflower furnishes a prominent product of the farm. Two kinds of sunflower are grown in Russia — one with small seeds, used for the production of oil, and the other with larger seeds, consumed by the people in enormous quantities as dainties. In the district where the seed is cultivated on a large scale, the plant has been continually grown on the same soil for many years in succession, thus producing a special disease of the plant. The sunflower seed is used principally for obtaining sunflower oil, which, owing to its nutritious qualities, purity, and agreeable flavor, has superseded all other vegetable oils in many parts of the country. In general, the cultivation of the sunflower in Russia is considered to be very profitable. At the average yield of 1,350 pounds to the acre, and at the average price of ¼d. a pound, the farmer receives an income of about £4 an acre, and this income can

be increased in those districts where the grower himself engaged in producing the oil from the seed. The substance remaining from the oil manufacture, or sunflower cakes, being used as cattle food, is also a valuable product. These cakes, however, have a comparatively small demand in Russia, but are largely exported to foreign countries, principally to Germany and England. The government of Saratov, for instance, exports about 2,000,000 pounds of sunflower cakes to different countries, where a further quantity of oil is extracted from them before being used for cattle food. The sunflower shells being used for heating purposes, form an article of trade in several districts. The seed-cups are not wasted, but are used as food for sheep. The peasants in the government of Tambov are increasing the cultivation of the sunflower owing to the following reasons. There is a steadily increasing demand at home and abroad for the seed, thus making the industry a profitable one, especially as Russia is the chief source of supply. As above mentioned, the sunflower is cultivated principally for the oil. If the cultivation is made with care, and if proper precautions are taken in drying, cleaning, and pressing, sunflower oil is equal to the French table oil in color, flavor, and taste. At first sunflower oil did not meet with public favor in Russia, but later on, owing to its good qualities and cheapness, it took the place of the oil of poppy seed; but for a long time hemp-seed oil competed with it, owing to the fact that the lower classes, who for many years had used the hemp-seed oil in the preparation of various dishes, and who had learnt to relish it, were not disposed to give it up. Now, however, public opinion has changed, and sunflower oil is preferred by the masses to all other table oils in Russia. The process of oil-making is as follows. The seed being brought to the oil mill, is thoroughly cleaned and sorted. They are passed under millstones, specially prepared for the purpose, in order to release the seed from the shells. After this the seed is properly dusted and put under a press, and, later on, into a mixer, where the seed is turned into a compact mass very much like paste, which passes into vessels heated by steam. From these vessels the paste is taken out and wrapped in a thin web, made of camel hair, and put under a press, by which the oil is squeezed out and conducted by pipes into tanks. The total number of oil mills in Russia was, according to the last account, 104. From this number 85 were applied solely to obtaining sunflower oil. In 24 of these mills steam is used, and in others only manual power. The largest mill is at Saratov, and it produces 1,500,000 pounds of oil annually. There are two kinds of oil obtained from the sunflower seeds. The better kind is sweet, and more expensive, the inferior having a bitter taste. The difference in price of these two qualities is about one halfpenny a pound. The oil remaining from the oil production or the waste, and not used as food, is applied exclusively to certain industries. The sunflower stalks, gathered from the fields, and dried in piles, have entirely replaced firewood; in fact, these stalks are preferred even to pine-wood, producing a quick and hot-flame fire. About 2,000 pounds of such firewood are gathered from an acre of land, thus adding a great boon to a district where wood is scarce. Sunflower shells are also used for heating purposes, not only in private houses, but in large factories as well. They are burned in ovens specially prepared for their consumption. The ashes of the sunflower contain a large percentage of potassium. The experiments of Hermbstedt have proved that 1,000 pounds of dried stalks yield 57.2 pounds of ash; and from 1,000 pounds of ash are obtained 349 pounds of the best potassium. As a food for cattle, sunflower cakes are looked upon as the best in Russia; they are considered better even than hemp or rape-seed cakes. According to chemical analyses, the sunflower cakes from the Government of Saratov contain: Azotic substances, 42.31 per cent; oil, 14.7 per cent, and ashes, 5.12 per cent. The dried seed-cups, if ground, are used in many districts as food for cattle, and particularly for sheep, with great success.

FLEXIBLE TUBING.[1]

At a meeting of the London Society of Arts, held on Wednesday evening, March 23, Mr. G. R. Redgrave gave an interesting lecture upon the subject of flexible tubing. After a passing reference to rubber tubing, leather hose, and similar ancient forms of this tubing, he proceeded to describe the flexible metallic tubes which had been invented by Mr. E. Levavasseur. This gentleman is, it appears, a jeweller, and many years ago invented necklaces and bracelets made out of tubes produced by coiling together two strips of gold and silver. One of these strips had a channel section, and the other, of a semicircular section, served to unite adjacent coils of the channel section together, and form a complete tube. About six years ago the idea occurred to him that flexible tubes could be formed on the same principle out of strips of metal, the tightness of the joints being secured by a strip of rubber. Many different forms of section for the strip were tried, the first being a sort of double channel section with which a great amount of flexibility was secured, but the heavy strain thrown on the rubber caused it to wear rapidly. In a later form the strip used was somewhat of the shape of a figure 8, which gave a more perfect interlock, so that the disruption of the tube could only be effected by the strips splitting under the strain. The rubber, too, was better protected and there was less chance of its working out. But this tube was less flexible than its predecessor, and suffered from the same defect in that the tightness of the joint depended upon a perishable material. Other forms of strips were tried in succession, and finally one has been arrived at in which a perfectly tight joint is secured without the use of any packing whatever, metallic surfaces only being in contact. The tubes thus formed are found to be tight under both high and low pressures, the form of the strip being such that the greater the pressure the tighter the joint. These tubes have been successfully used for conveying petroleum oil gas at a pressure of 300 pounds per square inch, and a small tube $\frac{3}{4}$-inch in diameter formed out of a strip 14 millimetres wide and .6 of a millimetre thick, only yielded at a pressure of 2,000 pounds per square inch. The tubes, moreover, will stand a partial vacuum. Their flexibility is such that a $\frac{5}{16}$-inch tube can be bent to a radius of 4 inches, and a one-inch tube to one of 6 inches. The tubes, moreover, can be trodden on with impunity, and would almost stand a cart being driven over them, a load of 18 hundred-weight on one inch of bearing surface being required to compress a 1 inch tube to an oval section. The difficulties of manufacture have been considerable, long flexible strips of a soft and uniform metal being required. Thus the $\frac{3}{4}$-inch tubes are made out of a strip 14 millimetres wide and .6 of a millimetre thick. At present such strips cannot be obtained of a greater length than 6,000 feet to 7,000 feet, and as 10 feet of strip are required for each 1 foot length of tube, the greatest continuous length that can be produced at the present time is limited, but it is thought that by means of electric welding this difficulty will

[1] From Engineering.

be overcome. The whole of the operations of forming the strip into the finished tube are accomplished in one continuous process by a single machine. The weight of the various sizes of tubing now manufactured ranges from 2½ ounces per foot for the $\frac{1}{16}$-inch tubing, which is the smallest size manufactured, up to 17 ounces per foot for the 1¼-inch tubing.

LETTERS TO THE EDITOR.

**** Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

On request in advance, one hundred copies of the number containing his communication will be furnished free to any correspondent.

The editor will be glad to publish any queries consonant with the character of the journal.

Zoology in the Public Schools of Washington, D.C.

IF there be one thing clearer than another to all thinking people of this or of any other highly civilized nation at the present time, it is that we are living in an age of great scientific progress. Among the dominant, most highly cultured races of the world this progress is characterized by its great rapidity, the exactness of its methods, and its far-reaching influence. It extends into all departments of human activity; it is felt along every imaginable line, both where the ends and aims are of a most utilitarian kind, as well as in quarters where the results arrived at appear to be, for a time, of a most impracticable nature. Solutions of abstract questions solved by the scientific philosopher and student, no longer, as of old, remain for an indefinite period hidden in an inaccessible literature, but quickly see the light in many places, and, in an incredibly short space of time, appear in the general literature of the day, in school and college text-books, and even in the daily newspapers. This being true, it was with no scant measure of surprise that the present writer had brought to his attention, very recently, a most remarkable case of misinstruction on the part of one of the teachers in a public school of Washington. It is no more than fair to say, however, that the statement made by the instructor to whom reference is made is supported by the author of one of the text-books in general use by the public schools throughout the District. The book in question is Mr. William Swinton's "Grammar School Geography," and in that production the author has adopted the plan of asking a series of questions, and then printing the replies to them on one of the maps given in illustration. On page 71 of his geography he asks, "What fish are taken in the Arctic region?" and on the accompanying map leaves the student to choose among a number of forms there given, none of which are *fish*, however, but where prominently occur such animals as the whale and the narwhal,—both of the last-named being typical and well-known marine mammals.

One of my sons attends the school to which allusion has been made, and it fell to his lot to get this question, and in making answer stated that no fish were named on the map in the Arctic regions; whereupon the teacher contended that both whale and narwhal were fish,—"and very big ones, too,"—directed him to take his seat, marked the reply against him as a miss, and appeared to be well pleased that the next scholar in turn replied more in keeping with his own notions in the premises, by stating that two large fish, at least, were found in the Arctic regions, and cited the two that have just been named. Now if there be one fact that zoology has made clearer than another, and it has been given in all authoritative lexicons, encyclopædias, and text-books throughout the world, it is that both the whale and narwhal are, as has been said, typical marine mammals, and belong just as much to the class Mammalia as does a man or a bear.

The believing that the whale is a big fish carries us back almost to the time when people entertained such erroneous conceptions of the earth and the creatures that live upon it, that it was popularly thought that the former was flat, that bats were birds, and horse-hairs could be converted into living hair-worms. My surprise is so great indeed at such a state of affairs existing in these times in our very midst that it absolutely forbids my making any comment thereon for fear that language might fail me to do the matter justice. It is surely high time that some effective course in elementary biology be included in our public school curriculum, and the sooner it is done, the sooner will our children come to be familiar with common facts, the true nature of things as they exist, and learn to appreciate the significance of a long-exploded idea when they meet with it.

E. W. SCHUFELDT.

Washington, D.C., April 4.

The Question of the Celts.

DR. BRINTON, in the last number of *Science*, asks Dr. P. Max Foshay for evidence upon certain suggested points, and now I should like to follow his example, and ask Dr. Brinton for his evidence that Dr. Theodore Köppen "repeats the familiar error of attributing the theory of the origin of the white race in Europe to Dr. Latham; whereas, long before he mentioned it, it had been urged with clearness by Omalius D'Halloy, the distinguished Belgian anthropologist" (*Science*, vol. xix., p. 174). Both Otto Schrader, "Prehistoric Antiquities of the Aryan Peoples" (Jevons's translation), p. 85, and Canon Isaac Taylor, "The Origin of the Aryans," p. 20, agree in assigning this distinction to the late eminent English philologist, as propounded by him in "The Germania of Tacitus, with Ethnological Dissertations and Notes," London, 1851, Epiligomena, p. cxxxix. (now before me). Will Dr. Brinton refer me to the work of "the distinguished Belgian anthropologist," and inform me whether he is in any way related to the distinguished Belgian geologist, Omalius D'Halloy?

Also, I should be glad to be referred to the work of Broca, in which he states that "the small, brown, brachycephalic Celts are a mixed type" (*Science*, ibid., p. 117). I have always understood Broca to maintain that they are a pure type, the real Celts of Cæsar's time, and that they are now represented by the inhabitants of central France.

Again, what is Dr. Brinton's authority for calling the type "of tall stature, with reddish or blond hair, and dolicocephalic crania," the Kymric? Is not this the Scandinavian, or Teutonic type, of Penka, which he regards as the original Aryan type?

Dr. Brinton is surprised to find Professor Schaaffhausen of Bonn denying that "the bands who overran Italy in 393 B.C. were Celtic. Surely the title of their chiefs, *brennus*, 'king,' is evidence enough that they spoke a Celtic dialect" (*Science*, ibid., p. 146). But speaking a dialect is no proof of blood relationship, and I suppose Schaaffhausen thinks that the followers of Brennus were really Galated, or of German origin. This is the problem discussed by Niebuhr, "History of Rome" (English translation), vol. ii., n. 1,169, in which the testimony of Celtic authors is quoted to show that the hair of the invading Celts was yellow, or red, while all Celtic peoples now have black hair. Niebuhr thinks that the law of permanency of physical constitution does not hold good for the hair, since now yellow or red hair has become uncommon among the Germans and Scandinavians in most parts. Thus it would seem that we can rely neither upon linguistic nor ethnological arguments wholly to settle the vexed question of the Celts.

HENRY W. HAYNES.

Boston, April 6.

AMONG THE PUBLISHERS.

THE famous geographer, Élisée Reclus, has just received, says *The Publishers' Weekly*, an unusual honor from the Paris Geographical Society. It has long been one of the traditions of this society that its gold medal should be awarded only to explorers who make discoveries of the first importance. This year it has deviated from its time-honored rule and has awarded its medal to a writer instead of to an explorer. The honor was given to M. Reclus to commemorate the approaching completion of his great work, "Nouvelle Géographie Universelle." The work is in eighteen large volumes, and Reclus is now at work on the last one. Reclus began this immense task in 1875. It is a monument of geographical learning, and, though intended for the people and written in a popular style, it is thoroughly scientific in spirit and treatment. It is an interesting fact that if it had not been for the intervention of Darwin and other great scientific men of England this greatest of all popular geographies would probably

never have been written, for Reclus, who is a Socialist in politics and who in 1871 was captured in Paris in the ranks of the Commune, had been condemned to penal servitude for life in New Caledonia, and he never would have been able to collect his material and write his book in that far-off Pacific island. Reclus was then 41 years old, and was already celebrated as a geographical authority. The hopes of his life, all the brilliant promise of his literary career, seemed in a moment blasted. The news of his great misfortune shocked the scientific men of all nations. In England they were prompt to act, and a petition, signed by all the scientific men of eminence in the country, was addressed to Thiers. The appeal was heard and the penalty of deportation was commuted to a sentence of perpetual banishment from France. Reclus has never since set foot upon his native soil, though the greatest work of his life has been brought out by Paris publishers. It is in Italy and Switzerland that he has been laboring for seventeen years on his "New Universal Geography," and the former political convict has produced on an average a volume a year, each book as large as a volume of the "New American Cyclopedia."

— *Babyhood* discusses in its April number the question whether children can outgrow catarrh. The writer, Dr. D. B. Delavan, takes strong ground against the popular idea that time will work a cure in the case of chronic catarrh and shows clearly the danger of neglect. Another important medical article is that on "Headaches of Children," by Dr. C. L. Dodge. The mothers themselves contribute a number of interesting letters to the "Parliament" on such topics as "Baby's Naps," "Rational Dress for Little Girls," "Gardening for Children," "The Traditions of the Elders," "Corporal punishment," etc.

—"Mutual Aid among Animals," by Geo. E. Walsh, is a notable article among the many good things in *Outing* for April. The article illustrates a pretty side of animated nature, and goes to show that mutual aid among animals is as apparent to the close observer as is the mutual struggle for supremacy.

— Houghton, Mifflin & Co. announce that they have in preparation a "History of the United States," by Mr. John Fiske, for the special use of schools. Mr. Fiske's world-wide reputation as a writer and scholar leads us to expect from him a School History

CALENDAR.

Women's Anthropological Society of America, Washington.

April 2.—Miss Woodhull, Report on College Extension; Mrs. Tullock, Report on Work of Deaconesses; Mrs. Kane, Report on Working Girls' Clubs.

Biological Society, Washington.

March 19.—The principal paper of the evening was: The Biological Basis of Psychology, by Professor Lester F. Ward. C. D. Walcott, On the Discovery of Certain Cambrian Fossils on the Coast of Massachusetts; F. H. Knowlton, The Fossil Flora of the Bozeman Coal-Field; C. W. Stiles, Notes on Parasites: Strongylus rubidus, Hassall and Stiles, 1892; H. E. Van Deman, Variations in the Fruit of Hicoria Pecan.

April 2.—The principal paper of the evening was: The Interdependence of Plants and Insects, by Professor C. V. Riley. C. Hart Merriam, The Distribution of Tree Yuccas (illustrated); H. E. Van Deman, Variations in the Fruit of Hicoria Pecan; C. W. Stiles, Notes on Parasites: Two Stages in the Life History of Distoma magnum, Bassi, 1875 (F. americana, Hassall, 1891).

Philosophical Society, Washington.

April 6.—T. Russell, River Stage Predictions; J. P. Iddings, A Study of a Dissected Volcano; Waldemar Lindgren, The Silver Deposits of Lake Valley, New Mexico.

Anthropological Society, Washington.

April 5.—Symposium on the Nomenclature and Teaching of Anthropology. Opened by Dr. Daniel G. Brinton of Philadelphia.

Society of Natural History, Boston.

April 6.—Percival Lowell, Shinto Occultism, God-Possession of the People; Harold C. Ernst, Some of the Advances in Bacteriology.

Exchanges.

[Free of charge to all, if of satisfactory character. Address N. D. C. Hodges, 874 Broadway, New York.]

For sale or exchange, Das Ausland, 10 vols., 1882 to 1891, including 6 vols. bound, 4 in numbers. Wheeler Survey, vol. 1, Geog. Report; also vol. 6, Botany; Production of gold and silver in the United States, 1880, '1, '2, '3, '5; Selfridge Isthmus of Darien. Will sell at very low prices. J. F. James, 1443 Corcoran St., Washington, D. C.

For exchange.—A fine thirteen-keyed flute in leather covered case, for a photograph camera suitable for making lantern slides. Flute cost $27, and is nearly new. U. O. COX, Mankato, Minn.

To exchange; Experiment Station bulletins and reports for bulletins and reports not in my file. I will send list of what I have for exchange. P. H. ROLFS, Lake City, Florida.

Finished specimens of all colors of Vermont marble for fine fossils or crystals. Will be given only for valuable specimens because of the cost of polishing. GEO. W. PERRY, State Geologist, Rutland, Vt.

For exchange.—Three copies of "American State Papers Bearing on Sunday Legislation," 1891, $2.50, new and unused, for "The Sabbath," by Harmon Kingsbury, 1840; "The Sabbath," by A. A. Phelps, 1842; "History of the Institution of the Sabbath Day, Its Uses and Abuses," by W. L. Fisher, 1859; "Humorous Phases of the Law," by Irving Browne; or other works amounting to value of books exchanged, on the question of governmental legislation in reference to religion, personal liberty, etc. If preferred, I will sell "American State Papers," and buy other books on the subject. WILLIAM ADDISON BLAKELY, Chicago, Ill.

Wanted, in exchange for the following works, any standard works on Surgery and on Diseases of Children: Wilson's "American Ornithology," 3 vols.; Coues' "Birds of the Northwest" and "Birds of the Colorado Valley," 2 vols.; Minot's "Land and Game Birds of New England;" Samuels' "Our Northern and Eastern Birds;" all the Reports on the Birds of the Pacific R. R. Survey, bound in 2 vols., morocco; and a complete set of the Reports of the Arkansas Geological Survey. Please give editions and dates in corresponding. R. ELLSWORTH CALL, High School, Des Moines, Iowa.

To exchange Wright's "Ice Age in North America" and Le Conte's "Elements of Geology" (Copyright 1882) for "Darwinism," by A. R. Wallace, "Origin of Species," by Darwin, "Descent of Man," by Darwin, "Man's Place in Nature," Huxley, "Mental Evolution in Animals," by Romanes, "Pre-Adamites," by Winchell. No books wanted except latest editions, and books in good condition. C. S. Brown, Jr., Vanderbilt University, Nashville, Tenn.

For Sale or Exchange for books a complete private chemical laboratory outfit. Includes large Becker balance (200g. to 1-10mg.), platinum dishes and crucibles, agate motors, glass-blowing apparatus, etc. For sale in part or whole. Also complete file of *Silliman's Journal*, 1820–1885 (62–131 bound); Smithsonian Reports, 1854–1883; U. S. Coast Survey, 1854–1869. Full particulars to enquirers. F. GARDINER, JR., Pomfret, Conn.

Wants.

Any person seeking a position for which he is qualified by his scientific attainments, or any person seeking some one to fill a position of this character, be it that of a teacher of science, chemist, draughtsman, or what not, can have the 'Want' inserted under this head at 10 cents a count line. Nothing inserted at less than 50 cents a time prepaid by stamps, if most convenient.

TRANSLATOR wanted to read German architectural works at sight (no writing). One familiar with technical terms desired. Address "A.," Box 149, New York Post Office.

WANTED.—A position in a manufacturing establishment by a manufacturing Chemist of inventive ability. Address M. W. B, care of *Science*, 874 Broadway, N. Y.

WANTED.—Books on Anatomy and Hypnotism. Will pay cash or give similar books in exchange. Also want medical battery and photo outfit. DR. ANDERSON, 182 State street, Chicago, Ill.

WANTED.—A college graduate with some normal training, to teach the sciences, at $1,800 per year, in a Southern college. A Baptist or a Methodist preferred. Must also be a first-class Latin scholar. A. H. Beals, Box K, Milledgeville, Ga.

A PROFESSORSHIP in Chemistry is wanted by one who has had five years' experience in that capacity. Would prefer to give instruction by lectures and experiments rather than by text-book methods. Would like a position in a college or university where there is a good student's laboratory. Special points of strength claimed are: (1) Thorough control of a class and good order during lectures and recitations. (2) Accuracy in experimenting with chemicals and skill in the manipulation of chemical apparatus. The permission of several distinguished educators has been given to refer to them if required. Would not care to accept a position paying less than $1,500. Address B. E., care of *Science*, Advertising Dept., 47 Lafayette Place, New York.

ADDRESS WANTED.—Will some one please send the address of the Secretary of the American Philological Society. Also that of Herbert Spencer. "ADDISON," Room 84, 164 Madison St., Chicago, Ill.

ADDRESSES of Old Book Dealers wanted.—Wishing to obtain a number of old books out of print, I very much desire the addresses or catalogues of rare second-hand book dealers. If there is a directory or list of such dealers I should like to obtain possession of one. W. A. BLAKELY, Chicago, Ill.

WANTED.—(1) A white man versed in wood and iron working, able to work from specifications and plans, suited for an instructor of boys; his business to have charge of shops of school, outline and direct the work for foremen and students; salary to be $1,000 per annum (nine months). (2) A man (black preferred) to teach the colored, iron working and forging, subordinate to the preceding; salary, $720. (3) A man (white) competent to take classes in engineering (assistant's position), but with the ability to perform any of the work required in any of the ordinary engineering courses of our universities; salary from $1,000 to $1,500. A. H. BEALS, Milledgeville, Ga.

unequaled in the purity of its English, in the fascination of its style, and in the accuracy of its statements. His hearty sympathy with the needs and possibilities of the school-room — as shown by the success of his historical lectures to school children, and by the popularity of his Civil Government for schools — assures us that he will employ his art to the great satisfaction of the practical teacher.

— A new book from the pen of Max O'Rell is announced by the Cassell Publishing Company. It bears the startling title "English Pharisees, French Crocodiles, and other Anglo-French Typical Characters." Max O'Rell dedicates this new and lively volume "To Jonathan," to whom he says: "I have drawn a few sketches for you. Perhaps they will show you that people can be happy without rolling in wealth or living in a furnace." The book is about the same size as "Jonathan and His Continent." Max O'Rell was never more amusing than in these pages in which he shows up the good points as well as the weaknesses of his native land and the land of his adoption.

— The April (1892) number of *The Alienist and Neurologist* contains: "Surgical Cure of Mental Maladies"—Résumé, by Dr. Guiseppe Seppilli, Italy; "Some Principles Involved in the Nature and Treatment of Inebriety," by T. L. Wright, M. D., Bellefontaine, Ohio; "Art in the Insane," by J. G. Kiernan, M. D., Chicago, Ill; "Drug Habituation," by Lucius W. Baker, M. D., Baldwinville, Mass.; "Tumor of the Cerebellum," by George J. Preston, M. D., Baltimore; "The Epidemic Inflammatory Neurosis; or Neurotic Influenza," by C. H. Hughes, M. D., St. Louis; "Pessimism in its Relation to Suicide," by Wm. W. Ireland, M. D., Scotland; "Classification of Insanity," by C. G. Chaddock, Traverse City, Mich.; "Report of a Case of Transitory Frenzy," by Theo. Diller, M. D., Pittsburgh; "Intermittent Paralysis," by L. Bremer, M. D., St. Louis.

QUERY.

Can any reader of *Science* cite a case of lightning stroke in which the dissipation of a small conductor (one-sixteenth of an inch in diameter, say,) has failed to protect between two horizontal planes passing through its upper and lower ends respectively? Plenty of cases have been found which show that when the conductor is dissipated the building is not injured to the extent explained (for many of these see volumes of Philosophical Transactions at the time when lightning was attracting the attention of the Royal Society), but not an exception is yet known, although this query has been published far and wide among electricians.

First inserted June 19. No response to date.

N. D. C. HODGES,

874 BROADWAY, NEW YORK.